

WHAT IS CLAIMED IS:

1. A method for manufacturing a micro-lens array substrate, comprising the steps of:

(1) disposing a stamper having a first micro-lens array pattern formed on one surface of the stamper and a second micro-lens array pattern formed on other surface of the stamper between a first transparent substrate and a second transparent substrate facing each other; and

(2) removing the stamper, after forming a micro-lens array which is made of a first light transmitting resin between the first transparent substrate and the stamper and forming a micro-lens array which is made of a second light transmitting resin between the second transparent substrate and the stamper, so as to fix a third light transmitting resin between the micro-lens arrays,

the stamper being removed under a condition where the first transparent substrate and the second transparent substrate maintain a state in which they face each other, movement of the second transparent substrate is restricted to a direction orthogonal to a substrate surface of the first transparent substrate, and movement of the first transparent substrate is restricted to a direction orthogonal to a substrate surface of the second transparent substrate.

2. The method according to claim 1, wherein the first transparent substrate, the second transparent substrate, and the stamper are held so as to be parallel to one another.

3. The method according to claim 1, wherein the micro-lens arrays which are respectively made of the first light transmitting resin and the second light transmitting resin are formed in a state where the stamper is set in place.

4. The method according to claim 1, wherein difference in refraction index between the first and third light transmitting resins after hardened and/or difference in refraction index between the second and third light transmitting resins after hardened are not less than 0.1.

5. The method according to claim 1, wherein a refraction index of the third light transmitting resin after hardened is higher than refraction indices of the first and second light transmitting resins after hardened.

6. The method according to claim 1, wherein at least one of the first light transmitting resin and the second light transmitting resin, and the third light transmitting

resin is ultraviolet-hardening resin.

7. The method according to claim 1, wherein the first light transmitting resin and the second light transmitting resin are made of the same material.

8. The method according to claim 1, further comprising:

a resin supplying step of supplying the first light transmitting resin between the first transparent substrate and the surface on which the first micro-lens array pattern is formed and supplying the second light transmitting resin between the second transparent substrate and the surface on which the second micro-lens array pattern is formed;

a contacting step of contacting the first transparent substrate and the stamper via the first light transmitting resin and contacting the second transparent substrate and the stamper via the second light transmitting resin;

a forming step of hardening the first light transmitting resin and the second light transmitting resin to form the respective micro-lens arrays;

a separating step of separating the micro-lens arrays from the stamper;

a removing step of removing the stamper from

between the micro-lens arrays;

a third resin supplying step of supplying the third light transmitting resin between the respective surfaces on which the two micro-lens arrays are formed;

a substrate contacting step of contacting the two micro-lens arrays via the third light transmitting resin; and

a third resin hardening step of hardening the third light transmitting resin.

9. A method for manufacturing a micro-lens array substrate, comprising the steps of:

(1) disposing a stamper having a first micro-lens array pattern formed on one surface of the stamper and a second micro-lens array pattern formed on other surface of the stamper between a first transparent substrate and a second transparent substrate being held on die sets and facing each other; and

(2) removing the stamper, after forming a micro-lens array which is made of a first light transmitting resin between the first transparent substrate and the stamper and forming a micro-lens array which is made of a second light transmitting resin between the second transparent substrate and the stamper, so as to fix a third light transmitting resin between the micro-lens arrays.

10. The method according to claim 9, wherein the micro-lens arrays which are respectively made of the first light transmitting resin and the second light transmitting resin are formed in a state where the stamper is set in place.

11. The method according to claim 9, wherein difference in refraction index between the first and third light transmitting resins after hardened and/or difference in refraction index between the second and third light transmitting resins after hardened are not less than 0.1.

12. The method according to claim 9, wherein a refraction index of the third light transmitting resin after hardened is higher than refraction indices of the first and second light transmitting resins after hardened.

13. The method according to claim 9, wherein the first light transmitting resin and the second light transmitting resin are made of the same material.

14. The method according to claim 9, wherein at least one of the first light transmitting resin and the second light transmitting resin, and the third light

transmitting resin is ultraviolet-hardening resin.

15. The method according to claim 9, comprising:

a resin supplying step of supplying the first light transmitting resin between the first transparent substrate and the surface on which the first micro-lens array pattern is formed and supplying the second light transmitting resin between the second transparent substrate and the surface on which the second micro-lens array pattern is formed;

a contacting step of contacting the first transparent substrate and the stamper via the first light transmitting resin and contacting the second transparent substrate and the stamper via the second light transmitting resin;

a forming step of hardening the first light transmitting resin and the second light transmitting resin to form the respective micro-lens arrays;

a separating step of separating the two micro-lens arrays from the stamper;

a removing step of removing the stamper from between the two micro-lens arrays;

a third resin supplying step of supplying the third light transmitting resin between the respective surfaces on which the two micro-lens arrays are formed;

a substrate contacting step of contacting the two

micro-lens arrays via the third light transmitting resin;
and

a third resin hardening step of hardening the third
light transmitting resin.

16. An apparatus for manufacturing a micro-lens
array substrate, in which micro-lens arrays which are
respectively made of a first light transmitting resin and a
second light transmitting resin are formed respectively on
a first transparent substrate and a second transparent
substrate, and a third light transmitting resin is fixed
between the micro-lens arrays to manufacture a
micro-lens array substrate,

the apparatus comprising:

first holder and second holder for holding the first
and second transparent substrates so that they face each
other;

a stamper holder for holding a stamper between the
first transparent substrate and the second transparent
substrate; and

a restriction member for restricting movements of the
first holder, the second holder, and the stamper holder to
a direction vertical to a substrate surface of the first
transparent substrate,

the stamper holder being adapted so that the

stamper can be removed from between the first holder and the second holder,

the stamper having a first micro-lens array pattern formed on one surface of the stamper and a second micro-lens array pattern formed on other surface of the stamper.

17. The apparatus according to claim 16, wherein the stamper holder is fixed to the restriction member.

18. The apparatus according to claim 16, wherein the stamper holder holds the stamper so that the stamper can pivot upon a direction vertical to the substrate surface of the first transparent substrate.

19. The apparatus according to claim 16, wherein the stamper holder fixes one end of the stamper and holds other end of the stamper removably.

20. The apparatus according to claim 16, wherein the stamper has a thickness of 1mm to 20mm.